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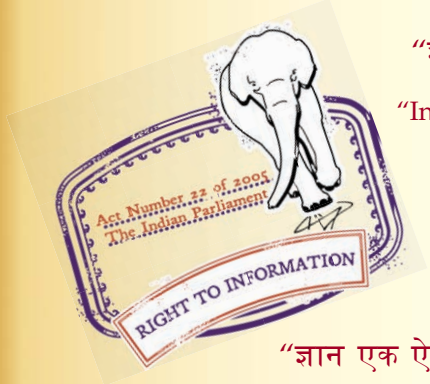
IS 10242-3-24 (1987): Electrical Installation in Ships, Part 3: Equipment, Section 24: Shipboard Telecommunication Cables and Radio Frequency Cables: Telephone Cables for Non-Essential Communication Services [ETD 20: Electrical Installation]



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"Knowledge is such a treasure which cannot be stolen"

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Electrical Equipment and Installations in Ships Sectional Committee, ETDC 62; Panel for Cables, ETDC 62/P4 [Ref : Doc : ETDC 62 (2859)]

Indian Standard (Reaffirmed 2002)

SPECIFICATION FOR ELECTRICAL INSTALLATION IN SHIPS

PART 3 EQUIPMENT

Section 24 Shipboard Telecommunication Cables and Radio Frequency Cables: Telephone Cables for Non-Essential Communication Services

0. Foreword

0.1 This standard (Part 3/Sec 24) is among the series of Indian Standards on electrical installations in ships. This series will have the following parts:

Part 1 General,

Part 2 System Design,

Part 3 Equipment,

Part 4 Installation and test of completed installation, and

Part 5 Special features.

0.2 In Part 3, to facilitate reference, Section 10 to 19 have been reserved for low and medium voltage power cables while Sections 20 to 29 would deal with telecommunication cables for use in ships.

0.3 This standard (Part 3/Sec 24) belongs to a series dealing with telecommunication cables and radio-frequency cables intended for the transmission of information rather than the transport of energy, and constructed specifically for that purpose. Other sections in this series are as follows:

Section 23 Shipboard flexible coaxial cables,

Section 25 General instrumentation, control and communication cables, and

Section 26 Shipboard multicore fiables for control circuits.

0.4 In the preparation of this standard, assistance has been taken from IEC Pub 92-374 (1977) 'Electrical installation in ships : Part 374 Shipboard telecommunication cables and radio-frequency cables: Telephone cables for non-essential communication services', issued by the International Electrotechnical Commission (IEC).

0.5 This part of the standard shall be read in conjunction with the other parts mentioned in **0.1.**

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. Scope — This standard (Part 3/Sec 24) applies to the shipboard telephone cables for non-essential communication services. It lays down the standard description and requirements for such cables.

Section 24A Description

2. General

2.1 Shipboard telephone cables for non-essential communication services shall consist of pairs of conductors insulated with polyvinyl chloride (PVC), laid up together and provided with a taped wrapping. The cores shall be collectively screened with a plain copper braid. The outer sheath shall consist of PVC.

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3. Conductor

3.1 The conductor shall consist of seven strands of plain or tinned annealed copper, uniform in quality and free from defects, each strand having a nominal diameter of 0·25 mm.

The properties of the copper shall be in accordance with IS : 9713-1981 'Specification for hot rolled electrolytic copper wire rods for electrical conductors (*first revision*)'.

4. Insulation

4.1 The insulation shall consist of PVC compound with a nominal thickness of 0·25 mm.

The category of insulation shall be PVC/A in accordance with IS : 10242 (Part 3/Sec 11)-1986 'Specification for electrical installation in ships: Part 3 Equipment, Sec 11 Insulation materials for shipboard power cables'.

5. Cabling Element

5.1 A cabling element shall be a pair of two insulated conductors twisted together and designated wire *a* and wire *b*.

5.2 The maximum length of lay in the finished cable shall be 120 mm. It can be advantageous to have different lengths of lay for adjacent pairs in order to reduce cross talk.

6. Stranding

6.1 *Concentric Layer Cables* — All the cabling elements shall be stranded in concentric layers.

Note — The successive layers of cabling elements may be separated from each other by interlayer binders consisting preferably of non-hygroscopic material.

6.2 *Unit Cables* — The cabling elements shall be bunched together in units of 20 cabling elements or, if necessary, in sub-units of five or ten cabling elements. The units and sub-units (if any) shall be stranded together.

7. Total Number of Pairs

7.1 The preferred total number of elements shall be multiple of five elements for cables comprising a total of up to 30 elements; a multiple of ten elements for cables comprising a total of more than 30 but not more than 60 elements and a multiple of 20 elements for cables comprising a total of more than 60 elements.

All elements assembled together form the core assembly of the cable.

Note — One single insulated conductor may be added for metering purposes; its diameter shall preferably be the same as that of the other conductors and its insulation shall be coloured white-red.

8. Tape Wrapping

8.1 The core assembly of the cable shall be wrapped with a protective layer of non-hygroscopic material, for example, a helical lapping of one or more polyester tapes.

9. Screen

9.1 A screen shall be applied over the taped wrapping. It shall consist of a braid of plain or tinned copper wires. The nominal diameter of the wires in the braid shall be in accordance with Table 1.

One or more plain or tinned copper wires may be placed under the braid in order to facilitate connection.

10. Sheath

10.1 The sheath shall consist of PVC. The quality of sheathing compound shall be ST1 according to IS : 10242 (Part 3/Sec 11)-1986.

The minimum average thickness shall be in accordance with Table 1.

TABLE 1 DIMENSIONAL DETAILS OF SHIPBOARD TELEPHONE CABLES FOR NON-ESSENTIAL COMMUNICATION SERVICES

(*Clauses* 9.1, 10.1 *and* 19.1)

Number and Composition of Conductors	Cross Sectional Area of Conductors	Nominal Thickness of Insulation	Nominal Diameter of Wires in Braided Screen	Minimum Average Thickness of Outer Sheath
mm	mm^2	mm	mm	mm
(1)	(2)	(3)	(4)	(5)
5 × 2/7 × 0·25	0·35	0·25	0·20	1·1
10 × 2/7 × 0·25			0·20	1·2
15 × 2/7 × 0·25			0·20	1·3
20 × 2/7 × 0·25			0·25	1·3
25 × 2/7 × 0·25			0·25	1·4
30 × 2/7 × 0·25			0·25	1·4
40 × 2/7 × 0·25			0·25	1·5
50 × 2/7 × 0·25			0·25	1·6
60 × 2/7 × 0·25			0·25	1·7
80 × 2/7 × 0·25			0·25	1·8
100 × 2/7 × 0·25			0·25	1·9

Section 24B Requirements

11. Conductor

11.1 The conductor shall be of the category 'circular non-compacted conductors' according to IS : 8130-1984 'Conductors for insulated electric cables and flexible cords (*first revision*) and their nominal cross-sectional area shall be 0·35 mm^2.

11.2 Elongation at break of the strands of the conductors shall be at least 15 percent. Compliance shall be checked by measuring the elongation at break in accordance with the method specified in IS : 5608 (Part 1)-1970 'Low frequency wires and cables with PVC insulation and PVC sheath: Part 1 General requirements and tests'.

12. Insulating Material

12.1 The PVC insulating compound PVC/A shall comply with the relevant provisions of IS : 10242 (Part 3/Sec 11)-1986.

13. Insulation Thickness

13.1 The insulation shall be continuous and of a thickness as uniform as possible. The minimum thickness shall be measured in accordance with the method specified in IS : 5608 (Part 1)-1970.

The smallest of the measured values shall not fall below 0·20 mm.

14. Identification of Insulated Conductors

14.1 Insulated conductors shall be identified by one colour or by a combination of two different colours. The identification shall be in accordance with IS : 5608 (Part 4)-1981 'Low frequency wire and cables with PVC insulation and PVC sheath: Part 4 Cables for indoor installations'.

15. Insulation Shrinkage after Overheating of the Conductor

15.1 The insulation shall not shrink unduly when soldering the conductors. The test shall be carried out in accordance with IS : 5608 (Part 1)-1970.

The shrinkage shall not be more than 4 percent.

16. Stripping Properties of Insulation

16.1 It shall be possible to strip the insulation from the conductor easily and without damage to the insulation or to the conductor. Compliance shall be checked by measuring the force necessary to start the sliding of the insulation in accordance with IS : 5608 (Part 1)-1970.

The value of the force is under consideration.

17. Screen

17.1 The screen shall consist of a symmetrical braid of plain copper wires. Joints in the braiding wires shall be soldered, twisted or woven-in and there shall be no joint in the complete braid. The braid shall be evenly applied.

The filling factor as specified in IS : 5026-1969 'General requirements and tests for radio frequency cables' shall be at least 0·6.

18. Sheath Material

18.1 The PVC sheath SV1 shall comply with the relevant provisions of IS : 10242 (Part 3/Sec 11)-1986.

19. Sheath Thickness

19.1 The sheath shall be continuous and of a thickness as uniform as possible. The mean thickness shall be not less than the thickness specified in Table 1.

The minimum thickness shall not fall below the specified mean thickness by more than 0·10 mm +15 percent of the specified thickness.

Both the mean thickness and the minimum thickness of the sheath shall be measured in accordance with the method described in IS : 5608 (Part 1)-1970.

20. Cable Marking

20.1 The cables shall be provided with an identification of the manufacturer and the year of manufacture.

Other requirements for marking are under consideration.

21. Flame Retardant Tests

21.1 The finished cable shall not transmit or assist flames. Compliance for flame-retardant characteristics of electric cables shall be checked in accordance with the test specified in IS : 10810 (Part 53)-1984 'Methods of test for cables: Part 53 Flammability test'.

Note — Further parts under IS : 10810 covering methods of tests for checking various characteristics for flame retardant properties of the cables are under preparation. Reference to these will, therefore, be added in due course. Till such time the relevant Indian Standards are available, the flame retardant characteristics of the cables may be checked in accordance with IEC Pub 331 (1970) 'Fire resisting characteristics of electric cables' and IEC Pub 332 (1970) 'Tests on electric cables under fire conditions'.

Section 24C Electric Properties of Finished Cable

22. Electrical Resistance of Conductors

22.1 The electrical resistance of each conductor shall not exceed 57·6 Ω/km at 20°C.

The method for measurement of resistance and also for correction of the measured values for length and temperature is described in IS : 5608 (Part 1)-1970.

23. Dielectric Strength

23.1 This test shall be carried out before the measurement of insulation resistance described in **24.** The test voltage may be either dc or ac. In the latter case, the waveform shall be approximately sinusoidal.

The frequency shall be between 40 and 60 Hz, and the voltage to be taken into consideration shall be expressed as an rms value. The test voltage shall be 1 000 V ac and 1 500 V dc.

The test shall be carried out on complete lengths of the finished cables.

The voltage shall be applied gradually and consecutively between either group of conductors and the other group connected to screen and earth in turn (a group is all conductors, *a*, connected together, or all conductors *b*, connected together).

The full voltage shall be maintained for 1 min.

24. Insulation Resistance

24.1 The insulation resistance shall be not less than 45 MΩ.km at the temperature of 20°C.

The method of measurement of insulation resistance is described in IS : 5608 (Part 1)-1970.

25. Mutual Capacitance

25.1 The mutual capacitance of any pair of conductors shall not exceed 150 nF/km. The mutual capacitance shall be measured on the finished cable. The measurement shall be carried out with alternating current at a frequency between 500 and 2 000 Hz, preferably at 800 Hz.

The mutual capacitance shall be measured on a certain number of elements between wire *a* and wire *b* all the remaining conductors being connected together and to the screen.

The measured mutual capacitance shall be corrected proportionally to the length, and expressed in nanofarads per kilometre.

26. Capacitance Unbalance

26.1 The capacitance unbalance between any pair of conductors shall not exceed 1 000 pF for 500 m length of cable.

The capacitance unbalance shall be measured on the finished cable. The measurement shall be carried out with alternating current at a frequency between 500 and 2 000 Hz, preferably at 800 Hz.

The capacitance unbalance shall be measured between different pairs. Adjacent cabling elements shall be selected for at least two-thirds of the tests.

The capacitance unbalance shall be expressed in picofarads for 500 m length of cable.

If the tested cable has a length L other than 500 m, the measured value shall be divided by a correction factor of:

$$\frac{1}{2}\left(\frac{L}{500}+\sqrt{\frac{L}{500}}\right)$$

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